CASE REPORT

Management of Deep Neck Infection with Descending Mediastinitis using Video-Assisted Thoracoscopic Surgery

Jean YH[ab], Mohamad I[a], Mamat AZ[c]

[a]*Department of Otorhinolaryngology-Head and Neck Surgery, School of Medical Sciences, Universiti Sains Malaysia, Kampus Kesihatan, Kota Bharu, Kelantan, Malaysia*

[b]*Department of Otorhinolaryngology, Hospital Sultanah Bahiyah, Alor Setar, Kedah, Malaysia*

[c]*Department of Surgery, School of Medical Sciences, Universiti Sains Malaysia, Kampus Kesihatan, Kota Bharu, Kelantan, Malaysia.*

Keywords
Deep neck infection, descending mediastinitis, video-assisted thoracoscopic surgery

Corresponding Author
Prof. Dr. Irfan Mohamad
Universiti Sains Malaysia,
Kampus Kesihatan, Kota Bharu,
Kelantan, Malaysia.
E-mail : irfankb@usm.my

Received: 19th Nov 2021; Accepted: 13rd March 2022

Doi: https://doi.org/10.31436/imjm.v22i3

ABSTRACT

Descending mediastinitis is defined as the spread of oropharyngeal or odontogenic infection into the mediastinum. It occurs uncommonly and has a high mortality rate. Prompt commencement of broad-spectrum antibiotics combined with surgical drainage is crucial to limit further spread of infection. We report a case of extensive deep neck infection in a 66-year-old female which rapidly progressed to the contralateral neck complicated by descending anterior mediastinitis. She underwent a combined transcervical and video-assisted thoracoscopic surgery (VATS) for drainage of abscess and was put on 3 weeks of intravenous antibiotics coupled with another 3 weeks of oral antibiotics. Deep neck infection with descending mediastinitis can be successfully treated with antibiotics and early surgical drainage via a combined transcervical and VATS approach.

INTRODUCTION

Descending mediastinitis is a condition whereby infection originating from the head and neck region spreads through deep fascial planes into the mediastinum. The reported incidence of descending mediastinitis arising from deep neck infection ranges from 6.3 – 17%.[1] Once complicated with mediastinitis, the mortality rate reaches up to 40%.[1] Early, accurate diagnosis and aggressive surgical treatment are required to effectively treat the disease. However, due to the vast diversity in cause and location of the infection, there is no consensus on the optimal method of surgical drainage.

CASE PRESENTATION

A 66-year-old Malay female, presented to casualty with 4 days history of right neck swelling which was increasing in size and painful. She felt feverish and complained of hoarseness and difficulty swallowing but denies obstructive airway symptoms. She also denied any history of recent foreign body ingestion. On examination, she had a muffled voice but was comfortable under room air. There was generalized swelling over the right neck extending from right submandibular area to the angle of mandible, inferiorly to below the hyoid bone, measuring 10x15cm. The swelling was warm and tender, fluctuant with a smooth surface. Intraorally, there were multiple dental caries with medialization of right lateral pharyngeal wall but no trismus. A flexible laryngoscopy showed medialization of the right lateral pharyngeal wall from the level of soft palate until laryngeal inlet with posterior pharyngeal wall bulge more on the right side.

Otherwise, supraglottic structures were not edematous and airway remained patent. Laboratory test was notable for leukocytosis (15,800 cells/ul), C-reactive protein (CRP) >200mg/dL with elevated HbA1c of 11.1% indicative of newly diagnosed diabetes mellitus. Lateral neck radiography revealed widening of the prevertebral space (Figure 1). A contrast-enhanced computed tomography (CECT) neck showed features of retropharyngeal abscess with extension to the anterior mediastinum, just behind the upper border of the manubrium sterni (Figure 2).

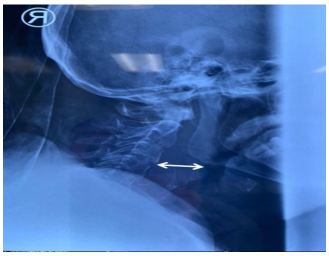

Figure 1: Lateral neck radiograph showing widening of prevertebral space (arrow)

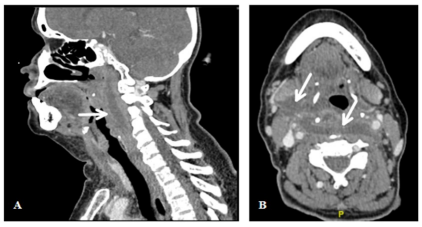

Figure 2: (A) CT neck in sagittal cut demonstrating downward spread of retropharyngeal abscess (arrow). (B) CT neck in axial cut showing abscess extending from retropharyngeal space (arrow) into right submandibular (arrow) and sublingual space during initial presentation.

Intravenous (IV) amoxicillin/clavulanic acid 1.2g TDS and IV metronidazole 500 mg TDS were initiated immediately. The abscess was drained via intraoral combined with external approach under general anesthesia. Post drainage she developed aspiration pneumonia with left parapneumonic effusion and antibiotic therapy escalated to IV ampicillin/ sulbactam 9g TDS. She also developed fast atrial fibrillation which was deemed to have been precipitated by sepsis. Her condition stabilized after a loading dose of IV amiodarone. Her intraoperative culture samples were positive for *Klebsiella pneumonia* with a good sensitivity profile to gentamicin, hence IV gentamycin commenced.

Subsequently, she developed a new painful neck swelling over the left (contralateral side). Repeated CECT neck-thorax showed abscess collection in bilateral deep neck spaces, extending inferiorly into anterior mediastinal until the level of T8 vertebra (Figure 3). She underwent re-exploration of right neck wound and drainage of left deep neck abscess in combination with cardiothoracic team for VATS and drainage of anterior mediastinal abscess. A negative pressure drain was kept in the anterior mediastinum for 10 days. After removal of the chest tube, a loculated hypoechoic collection in the anterior mediastinum seen on ultrasound during monitoring of disease progression. An ultrasound-guided percutaneous thoracic drainage was performed to drain the remaining collection.

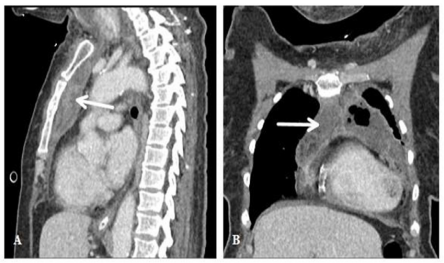

Figure 3: (A) Repeated CT thorax in sagittal view demonstrating peripherally enhancing collection in the anterior mediastinum (arrow). (B) CT thorax in coronal view with multiloculated rim enhancing collection with air pockets (arrow) in the anterior and superior mediastinum.

Given her extensive disease involving the mediastinum, she completed a total of 3 weeks of IV antibiotics and neck dressing with super-oxidized anti-microbial solution twice daily. Glycemic control was achieved in ward by tapering subcutaneous insulin and providing diabetic counselling. She was discharged with another 3 weeks of oral ciprofloxacin 500mg BD to complete a total 6 weeks duration of antibiotics as suggested by infectious disease team. During review in clinic 2 months post-op, she made an uneventful recovery with complete closure of her neck wound.

DISCUSSION

Descending cervical mediastinitis is a condition that is infrequently reported but carries a high mortality rate. The proximity of the neck spaces to vital structures and its possible extension to the mediastinum may turn a relatively straightforward cervical infection into potentially lethal descending mediastinitis. It is important to have a high index of suspicion to ascertain the extension of disease. Conventional radiograph may display signs such as retropharyngeal soft tissue swelling, widened mediastinum or pneumomediastinum, however it is of limited sensitivity.[2]

Therefore, CECT scan is a better and more commonly used test to achieve early diagnosis, monitor the adequacy of surgical drainage and detect abscess recurrence. It has been suggested that CT imaging should be done routinely every 48 hours post drainage until improvement of disease.[3] In our patient, the initial CT scan showed abscess collection only up to the level of manubrium sterni however the second CT scan showed extensive spread into anterior mediastinum until the level of T8 vertebra.

Inadequate drainage during patient's first operation might have led to the development of descending mediastinitis. Repeated imaging should be done when there is a concern of abscess recurrence and to rule out possible complications. Odontogenic infection used to be the most common cause of descending mediastinitis. However, a literature review by Kocher et al.[4] in 2012 sees a change in trend whereby there is a predominance in pharyngeal causes in recent studies. Subsequent caudal spread into the mediastinum is facilitated by gravity, respiration as well by negative intrathoracic and pleural pressure during inspiration.[5] In our case, poor dental hygiene is the most likely source of infection. Patient having undiagnosed diabetes mellitus also increased the chance of mediastinal spread.

70% of the cases of mediastinal spread occurs through the retropharyngeal space to the posterior mediastinum.[5] It is reported as the main spreading route, especially for odontogenic infections. Infection of the anterior mediastinum commonly originates from the thyroid gland or tracheostomy site. Although a rare route of infection, in our patient the pretracheal space is likely violated during the first surgical drainage leaving opportunities for direct access from an odontogenic infection. This explains the development of anterior mediastinal abscess seen in our patient. Studies have delineated several factors such as older age groups of > 55 years, coexisting morbidities such as diabetes, involvement of two or more neck spaces, neutrophil to lymphocyte ratio ≥ 13, and CRP ≥ 30mg/dL as clinical predictors of subsequent development of descending mediastinitis.[3,6]

These values were seen in our patient and subject her to a higher risk of developing descending mediastinitis. In our case, *Klebsiella pneumonia* was isolated and this is coherent with a study by Sharma et al.[7] which showed a predominance of *Klebsiella* organism in the diabetic population. Identification of the causative microorganism and its antibiotic sensitivity is essential in guiding the choice of antibiotics. Usage of microbial resistant antibiotics at the initial stage may be a contributing factor to the failure of the first surgical drainage in our patient. To achieve effective treatment of descending mediastinitis, empirical treatment with broad-spectrum antibiotics should be started. β-lactamase inhibitor such as piperacillin -tazobactam combined with metronidazole has been proposed as the therapy of choice.[8] To date, there is no guideline on the adequate duration of antibiotics for descending mediastinitis. The optimal duration of therapy and selection of antibiotics ultimately depends on the culture growth and clinical signs of improvement from the patient. It is also important to repeat cultures throughout the clinical course of treatment as antibiotic-resistant bacteria may develop in open wounds.[9] Surgical drainage along with appropriate antibiotic coverage is the mainstay of treatment. However, the ideal surgical approach to the site of infection remains an area of discussion. Since the emergence of minimally invasive technique, an increasing number of authors have advocated the use of VATS.

This is because VATS can provide an excellent view of the thoracic cavity with minimal wound opening, allowing faster healing and favorable outcome.[8] Especially if a patient is critically ill and unable to tolerate a high-risk open thoracic surgery. Comparatively, a sternotomy is required when performing an open thoracic surgery. Performing a sternotomy in a patient with disseminated infection and mediastinal abscess exposes the patient to risk of sternal wound complications including infection, sternal wound dehiscence and sternal osteomyelitis. This can lead to complete wound breakdown, which may require removal of sternal wires which are foreign bodies therefore more susceptible to infection. If removal of sternal wire is required, this leads to an unstable sternum which in turn can lead to ventilatory compromise and may require complex reconstructive flap surgery in the future.

In our case, the abscess collection was in the deep neck spaces tracking down to the anterior mediastinum. We opted for a combination of transcervical and VATS via 2 small incisions in the left chest wall. A 5mm camera port was inserted and the lung tissue was mobilized with instruments via the working port to visualize the anterior mediastinal space. Anterior mediastinal abscess was drained with abundant irrigation of the mediastinal space and continuous drainage with chest drains afterward. In view of the potential complications with open thoracic surgery, VATS has an important role in allowing for surgical drainage with minimal disruption to the

surrounding structures such as sternum while allowing excellent visualization. VATS surgery is also less painful and allows for early mobilization post operatively and faster recovery of respiratory function. Recent systemic review has reported a decline in mortality rate to 18% with early intervention using combine thoracic-cervical drainage approach.[10] Additionally, patient treated with combined approach was able to wean off mechanical ventilation faster compared to those without.[10]

CONCLUSION

Early intervention and appropriate medical optimization are crucial to prevent the progression of descending mediastinitis to septic shock and will dramatically improve the survival rates. Whichever surgical method is used, the aim of surgery is to achieve adequate exposure and drainage of all the involved spaces, obtaining appropriate aerobic and anaerobic cultures with maintenance of airway control remaining the utmost importance. The surgical approach of choice should be chosen according to the patients' condition, the extent of disease and the surgeons' experience. If at any point in time should the airway become compromised, tracheostomy should be considered.

CONFLICT OF INTEREST

None to declare.

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